

Academic Year: (2024 / 2025)

Review date: 23-04-2024

Department assigned to the subject: Statistics Department

Coordinating teacher: MEILAN VILA, ANDREA

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Stochastic Processes

DESCRIPTION OF CONTENTS: PROGRAMME

- 1 - Brownian motion
 - 1.1 Definition and properties
 - 1.2 Derived Processes
 - 1.3 Simulation
- 2 - Martingales in continuous time
 - 2.1 Definition and properties
 - 2.2 Optional sampling theorem
- 3 - Stochastic Integration
 - 3.1 Definition and properties
 - 3.2 Lema of Itô
 - 3.3 Girsanov's theorem
 - 3.4 Martingale Representation Theorem
- 4 - Introduction to differential stochastic equations
 - 4.1 Itô's Stochastic Differential Equations
 - 4.2 Linear Differential Equations
 - 4.3 Digital solutions
- 5 - Applications of stochastic calculus to Finance
 - 5.1 The Black-Scholes formula
 - 5.2 Risk neutral measures
 - 5.3 Pricing Exotic options
 - 5.4 Pricing American options

LEARNING ACTIVITIES AND METHODOLOGY

Theory (4 ECTS). Lectures.
Practice (2 ECTS). Problem solving lessons.

ASSESSMENT SYSTEM

% end-of-term-examination:	0
% of continuous assessment (assignments, laboratory, practicals...):	100
The subject will be evaluated through two partial exams (50% each of them).	

BASIC BIBLIOGRAPHY

- H. Bühlmann Mathematical Methods in Risk Theory., Springer, 1996 (2nd. ed)
- R. Durrett Essentials of stochastic processes, Springer, 2012 (2nd ed.)
- S. Asmussen and H. Albrecher Ruin Probabilities, World Scientific, 2010 (2nd. ed.)
- S.M. Ross Stochastic Processes, John Wiley & Sons, inc., 1996 (2nd. ed.)

BASIC ELECTRONIC RESOURCES

- R. Durrett . Essentials of Stochastic Processes: <http://www.math.duke.edu/~rtd/EOSP/EOSP2E.pdf>